

# Unit Planning Guide: Unit 7 of 8

Unit Title: Surface Area and Volume	Pacing (Duration of Unit): 20 days
Grade: Geometry	Buffer Day(s): 5 days

## Desired Results

### Transfer Goals

Students will be able to independently use their learning to:

- **Make sense of problems and persevere in solving them.**
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- **Model with mathematics.**
- Use appropriate tools strategically.
- **Attend to precision.**
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

### Established Goals (2011 MA Curriculum Frameworks Standards Incorporating the Common Core State Standards)

#### Pre-Requisite Standards:

- **7. G.3-** Describe the two dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
- **7.G.6-** Solve real world and mathematical problems involving area, volume, and surface area of two and three dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
- **7.G.MA.7-** Solve real world and mathematical problems involving the surface area of spheres.
- **8.G.9-** Know the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real world and mathematical problems.

#### Standards (Priority Standards in bold):

- **G.GMD.3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.**
- **G.GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.**
- **NQ2. Define appropriate quantities for the purpose of descriptive modeling.**
- **NQ3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.**
- **GMG.3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).**
- GMG.MA.4. Use dimensional analysis for unit conversions to confirm that expressions and equations make sense.
- GGPE.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.
- GGMD.1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*
- GGMD.2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.
- NQ.MA.3.a. Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. Identify significant figures in recorded measures and computed values based on the context given and the precision of the tools used to measure.
- GMG.1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
- GMG.2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

*(+) indicates standard beyond College and Career Ready*

#### WIDA for English Language Learners

Standard 1: ELLs **communicate** for **Social** and **Instructional** purposes within the school setting  
Standard 3: ELLs **communicate** information, ideas and concepts necessary for academic success in the content area of **Mathematics**

In the lesson planning stage, teachers will need to differentiate lessons for ELLs. In order to accomplish this they will need: 1.) this curriculum map, 2.) a list of their ELLs and their proficiency levels, and 3.) appropriate language function expectations and scaffolds or supports.

**Meaning (\*Mostly assessed through Performance Tasks/Assessments)**

**Big Ideas:**

- Geometry and spatial sense offer ways to interpret and reflect on our physical environment.
- Understanding that surface area of a solid is the sum of the area of all the faces (relate to the perimeter of a 2-d figure) and that volume is the area of the base times the height of the solid (relate to the area of a 2-d figure)
- Analyzing geometric relationships develops reasoning and justification skills.

**Essential Questions:**

- How can you explain the relationship between congruence and similarity in both two and three dimensions?
- How can surface area and volume be used in packaging and containing objects, food, etc?

**Acquisition (\*Mostly assessed through traditional summative assessments)**

**Knowledge:**

*Students will know ...*

- the difference between **surface area** and **volume**
- the relationship between 2 dimensional and 3 dimensional figures
- the definition of **net, face, edge, base, and vertex**
- the formulas for surface area and volume of **prisms, cylinders, cones, pyramids, and spheres**
- that equations make sense based on **unit conversions**
- that accuracy depends on the use of irrational numbers and rounding decimals while calculating

**Bolded words are key academic vocabulary**

**Skills:**

*Students will be skilled at:*

- identifying the shapes of 2-d cross-sections of 3-d solids (*Knowledge*)
- identifying 3-d solids as a rotation of 2-d figures (*Knowledge*)
- deriving the formulas for surface area and volume of common solids (*Synthesis*)
- finding the slant height (using Pythagorean Theorem) for a cone and pyramid to calculate the surface area of those solids. (*Application*)
- using the volume and surface area formulas for common solids to solve problems (*Application*)
- defining appropriate quantities and choosing a level of accuracy for a given problem (*Evaluation*)
- describing the effects of approximate error in measurement and rounding on measurements and on computed values from measurements (*Comprehension*)
- applying geometric methods to solve design problems (*Application*)
- using coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula (*Application*)
- applying concepts of density based on area and volume in modeling situations (*Application*)
- using geometric shapes, their measures, and their properties to describe objects (*Comprehension*)
- (+) giving an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. (*Evaluation*)

**(+) indicates standard beyond College and Career Ready**

McDougal Littell  
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Chapter 12

12.1

12.2/12.3 (review)

12.4/12.5/12.6

12.7